

# ANIMAL NUTRITION



Animals *need* to eat their  
veggies too!



Every living organism needs certain nutrients for biological functioning for tissue growth, maintenance, repair and various other productive processes. Animal nutrition focuses on domesticated animal's dietary needs primarily in agriculture and the production of food. A quality feed promotes the health of animals.

Types of feed include equine nutrition, sheep husbandry, pig farming, cattle feeding, pet food (cat, dog, bird) and poultry feed; Key to any animal nutrition program is water. In fact, livestock health issues can result from poor quality water, and water consumption is even more important than the consumption of food. Hence, a thriving livestock operation must have a good and safe water supply in both quality and quantity. When livestock does not consume enough safe water on a daily basis, feed consumption decreases which adversely impacts production and results in revenue losses.

### Methods Of Nutrition

The system or process by which any organism takes in food is called "methods of nutrition", and there are basically two (2) methods for animals: a) autotrophic and b) heterotrophic. The noun derivatives are defined as:

**Autotroph:** An organism capable of synthesizing its own food from inorganic substances using light or chemical energy. Examples: Green plants, algae, and certain bacteria.

**Heterotroph:** An organism which cannot manufacture its own food and instead obtains its food and energy by taking in organic substances, usually plant or animal matter. Examples: **All animals**, protozoans, fungi, and most bacteria

The most effective nutritional regimen for animals should include sufficient intakes of amino acids (nonessential and essential), fatty acids, vitamins, minerals, and carbohydrates via a program of supplements that compensate for any deficiencies in basic diets (i.e. corn, soybean, milk). Also, for some nutrients (i.e. glutamine, arginine, zinc, and conjugated linoleic acid) dietary supplements can govern gene expression and important paths to fertility improvement, pregnancy result, neonatal growth/survival, immune function and feed and meat quality. A balance of vitamins, minerals, protein and energy is essential for a cost-efficient yet productive nutrition program.

Ultimately, better animal nutrition can result in an increase in the quality of livestock production. This, in turn, can lead to the production of a higher quality meat, stronger wool, healthier eggs, etc.

### A 'Bite' Out Of History

Back in 1917 a subcommittee on Protein Metabolism in Animal Feeding was established by the National Research Council (NRC) Agriculture Committee led by Dr. Henry P. Armsby, Director of the Institute of Nutrition, Pennsylvania State College. This subcommittee created the Plan for Cooperative Experiments on Protein Requirements for Growth in Cattle (NRC, 1917) to assist in finding answers to questions about the minimum dietary nitrogen amounts needed to increase cattle productivity while decreasing the use of supplemental proteins that were in short supply. *(continued on next page)*

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Later, In 1919, the NRC's Division of Biology and Agriculture organized a Committee on Food and Nutrition then divided its responsibilities between two subcommittees: Human Nutrition and Animal Nutrition, respectively. The Committee on Food and Nutrition discharged in 1928, and the Committee on Animal Nutrition (CAN) was established and has continued for 70+ years. Up until his death in 1922, Dr. Armsby oversaw the work of CAN. Until 1941, the chairman was Dr. Paul E. Howe, a biochemist with the U.S.D.A. Bureau of Animal Industry.

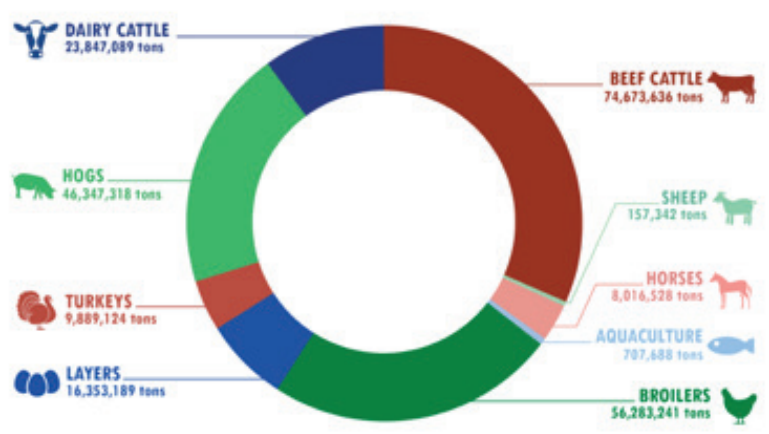
Several reports were produced on animal production experimental methods (NRC, 1923), the findings of studies on protein requirements for cattle growth (NRC, 1924), results of protein requirements of animals and concentrations of protein in feed (NRC, 1926). The services of CAN were happening at the time of the great depression of the late 20s-30s when many families had no electricity. It was a tragic period particularly in rural America as commodity prices were very low. At this same time, the central and southern plains regions were in the midst of a drought (the historic Dust Bowl period). Despite all this, progress was made in the realm of discovery. Several 'essential'

nutrients were identified, including cobalt, niacin, pantothenic acid, riboflavin, vitamin B6, vitamin K and certain fatty acids.

During the 1940's, CAN's publications focused on the issues of the time, namely war emergency plans for feeding animals (i.e. swine, poultry, cattle, etc.). These were provided by CAN nutritionists. In the instances of shortages (for example, phosphorus), alternative sources were used in animal diets. Also, when proteins were removed from animal diets, the need for supplemental iodine was met. CAN's expert nutritionists worked to ensure that the limited animal feed supplies could be addressed successfully.

During the late 1940's CAN determined that the best method to express a nutrient requirement was as the smallest dietary concentration for the most demanding function in order to maintain normal performance. By use of purified diets, nutrient requirements were basically established; but with natural ingredient diets, nutrients are typically less available as with purified diets. Consequently, when it was possible, an estimate had to be projected regarding anticipated nutrient absorption in natural dietary

### THE DEMAND FOR ANIMAL FOOD IS STRONG



In 2016, over 236 million tons of animal food were consumed by nine animal species.

ingredients. Beginning in 1953, the NRC Nutrient Requirement Series provided nutrient requirements which are validated by scientific evidence or reflects that the requirements provided are estimations.

## Today

Now the responsibility for this tradition falls under the purview of the Animal Nutrition Program of the Board on Agriculture and Natural Resources (BANR). The program's principal focus is The Nutrient Requirements of Domestic Animals series, which encompasses approximately thirty (30) species of companion animals, farm animals, laboratory species and wildlife. Publications in this series serve as a worldwide standard for government agencies (for regulatory purposes), by universities, the food and feed industry, veterinarians, pet owners, extension personnel and livestock producers. The Animal Nutrition Program additionally addresses new issues through events and reports.

Publications on nutrient requirements by NRC CAN are broad with reports on horses, beef cattle, dairy cattle, poultry, sheep, swine, mink and foxes, rabbits, goats, hamsters, fish, dogs, cats, nonhuman primates and laboratory animals (guinea pigs, gerbils, mice, rats, gerbils and voles). Some requirement data is provided on nine fish species but with nonhuman primates, wherein there are over 200 species, presents a greater challenge in nutrient requirements. Over the years, the actions of the two committees have changed in keeping with changing national needs and issues. In the beginning, the primary focus of CAN was on improvements in animal nutrition and sufficient food supply in war time.

The emphasis now is focused on four principal areas:

- Animal Production: Improvement,

efficiency and production

- Food Safety: Enhancements in quality and safety
- Animal and Human Health: Animal/human health and well-being.
- Environmental Quality: Refinement in animal feeding; reduction of environmental impacts.

Technological and scientific advances, coupled with changes in management approaches to deal with environmental concerns, necessitate continuous reassessment of animal nutrition and feeding methodologies. The Animal Nutrition Program will continue to work and answer requests received from various organizations in industry and government by using committee discussions, policy studies, workshops, conferences, task forces, briefs, symposia, public forums, international satellite programs, etc.

The knowledge, history and established traditions of these programs have created concise mechanisms, strengths and responsibilities for continuing actions that are essential for the nation.



- J.A. Bell

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